Blessing

$t\bar{t}$ CROSS-SECTION WITH JET PROBABILITY

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Top Meeting

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Outline

- Motivations and Analysis Overview

- Questions and Answers

  www-cdf.fnal.gov/internal/physics/top/RunIIWjets/webpages/jetprob/cdfonly.html

- Results for Blessing

Motivations and Analysis Overview

- Motivation
  - ◇ Cross check $t\bar{t}$ x-section measurement with a different tagging algorithm
  - ◇ JP provides (a priori) a more flexible way to understand the composition of the tagged sample by tunning the JP cut
  - ◇ JP can be tuned/optimized differently for other kind of analysis

- Main goal: Optimize and publish this analysis with gen5 and $\sim$400 pb^{-1} of data

Motivations and Analysis Overview

- Overview of the analysis
  - ◇ We use v.4.11 offline (Data sample $\sim$162 pb^{-1}).
    - ⋆ Jet Probability parametrization (provided by the Florida group) available in this release only (CDF Note 6315)
    - ⋆ Jet Probability efficiency and Tag Rate Matrix described in CDF Note 6931 and 6913 respectively
  - ◇ We have remade the official Top ntuples in order to include the JP information for the samples of lepton+jets data, $t\bar{t}$ MC W+HF and W+jets backgrounds, diboson, $Z \to \tau^+\tau^-$ and single top
  - ◇ Event selection based on the standard Lepton+jets selection (CDF Note 6844)
  - ◇ At least a jet with JP$<$0.01 required (no attempt has been done so far to make an optimization cut)

Motivations and Analysis Overview

- $\sim$685000 $t\bar{t}$ events from TTOPEI dataset used to reproduce acceptance and compute tagging efficiencies

- Background Estimate:

  - Mistagged events predicted by means of the negative tag rate matrix

  - Non-W contribution derived with the $\not\!\!E_T$ vs lepton isolation method

  - W+Heavy flavor background estimated by using the standard Method 2

  - Diboson, $Z \to \tau\tau$ and single top events derived from Monte Carlo

- All the results are in
  CDF Note 7150
  www-cdf.fnal.gov/internal/physics/top/RunIIWjets/webpages/jetprob/cdfonly.html

Questions and Answers

Q Do you know the qualitative reason why JP needs Z_{vtx} for the tag rate matrix, while SecVtx does not?

A Track selection for SecVtx and JP taggers is different:

* The SecVtx algorithm requires at least three good hits on three different layers
* Z_{vtx} dependence is taken into account by the N_{trk} and η variables
* JP tagger requires three hits, no matter if good or not
* JP is less sensitive to the three-barrel geometry of the silicon detector

Questions and Answers

Q Why do you have non overlapping events in the JP and SecVtx selected samples?

A The SecVtx and the JP taggers use a different track selection:

⋆ SecVtx applies tighter requirements on the silicon hits

⋆ JP makes a tighter upper cut on the track impact parameter:

  – JP: $|d_0^{max}| < 0.1\ cm$

  – SecVtx: $|d_0^{max}| < 0.3\ cm$

Questions and Answers

Q What signal simulation are you using?

A As quoted in the note, we are using the TTOPEI dataset

⋆ In the preblessing talk we said TTOPLI because of a typo

Q There is some disagreement between the pretag samples in the acceptance note 6844 (Table 5) and this analysis (Table 2). Why?

A Table 5 in CDF Note 6844 refers to 193.5 pb-1 of data before silicon good run requirement

⋆ Table 2 in our note refers to 161.6 pb-1 of good silicon run data

Questions and Answers

Q Why is the statistical error on $\epsilon_{t\bar{t}} \int$ Ldt much greater than in the SecVtx Analysis?

A Error: we put the error on the luminosity both in the systematic and statistical uncertainties (new Table 5 in the note)!

Quantity	CEM	CMUP	CMX
JP (QCD cut applied, SF = 0.787 $\pm$ 0.105)			
Acc. No Tag	4.09 $\pm$ 0.04 $\pm$ 0.33	2.12 $\pm$ 0.02 $\pm$ 0.21	0.95 $\pm$ 0.01 $\pm$ 0.12
Tag Eff	56.99 $\pm$ 0.28 $\pm$ 6.66	56.88 $\pm$ 0.36 $\pm$ 6.67	57.84 $\pm$ 0.60 $\pm$ 6.67
Average Tag Eff	57.24 $\pm$ 0.21 $\pm$ 3.85		
Acc. with Tag	2.33 $\pm$ 0.03 $\pm$ 0.33	1.21 $\pm$ 0.01 $\pm$ 0.19	0.55 $\pm$ 0.01 $\pm$ 0.09
Lum (pb^{-1})	161.6 $\pm$ 9.5	161.6 $\pm$ 9.5	149.8 $\pm$ 8.8
$\epsilon_{t\bar{t}} \int$ L dt	3.77 $\pm$ 0.05 $\pm$ 0.58	1.95 $\pm$ 0.02 $\pm$ 0.32	0.82 $\pm$ 0.01 $\pm$ 0.15
SecVtx (QCD cut not applied, SF = 0.81 $\pm$ 0.07)			
Tag Eff	52.2 $\pm$ 0.386 $\pm$ 3.68	51.9 $\pm$ 0.492 $\pm$ 3.66	53.6 $\pm$ 0.804 $\pm$ 3.78
Average Tag Eff	52.3 $\pm$ 0.284 $\pm$ 3.69		
$\epsilon_{t\bar{t}} \int$ L dt	3.65 $\pm$ 0.04 $\pm$ 0.47	1.90 $\pm$ 0.02 $\pm$ 0.24	0.80 $\pm$ 0.01 $\pm$ 0.10

Questions and Answers

Q Could you provide the tagging efficiency for b-jets and c-jets derived from MC separately?

A Efficiencies for $b(c)$-jets computed by matching $b(c)$ partons to the jets

⋆ The denominator is the number of events passing kinematic selection

	CEM	CMUP	CMX
b's efficiency (%)	$54.93 \pm 0.28 \pm 7.14$	$54.25 \pm 0.36 \pm 7.05$	$55.23 \pm 0.60 \pm 7.05$
c's efficiency (%)	$3.43 \pm 0.10 \pm 0.69$	$3.51 \pm 0.36 \pm 0.70$	$3.70 \pm 0.28 \pm 0.74$
total eff. (%)	56.99 $\pm$ 0.28 $\pm$6.66	56.88 $\pm$ 0.30 $\pm$ 6.67	57.84 $\pm$ 0.60 $\pm$ 6.67

Questions and Answers

Q To estimate mistag background you used the negative tag rate matrix and attached $+20\%$ error. Why do not you use the 1.2 factor from SecVtx studies?

A We plan to do a sample composition study for JP with gen5

- ⋆ We do not know the effect of the material on the positive tag rate and it is not easy to say how much the effect can be different from SecVtx
- ⋆ We would expect our scale factor due to material interactions and longed lived Ks or Lambdas to be smaller, because JetProbability uses a tighter upper cut on the track d_0 ($|d_0^{max}| < 0.1\ cm$ for JP, $|d_0^{max}| < 0.3\ cm$ for SecVtx
- ⋆ Using the 1.2 factor is not going to reduce our uncertainty
- ⋆ If we apply the scale factor we obtain a shift on the cross section from 5.8 to $5.7\ pb$, that is very well covered by our systematic uncertainty

Questions and Answers

Q Could you show how you calculate the uncertainty on mistag background? Why is it symmetric if you have a $+20\%$. Do you take into account errors on F_{Non-W}?

A Before corrections: errors due to statistics from the mistag matrix

- ⋆ Correlation between mistag probabilities from the same bin of the matrix included

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Mistag matrix prediction				
Mistag electrons	24.1 ± 1.8	9.08 ± 0.95	2.87 ± 0.03	1.42 ± 0.03
Mistag muons	17.0 ± 1.6	5.76 ± 1.05	1.57 ± 0.08	0.83 ± 0.01
Total	41.1 ± 2.5	14.84 ± 1.66	4.44 ± 0.09	2.26 ± 0.03
Prediction $\times$ (1-F_{QCD}) & $+20\%$ sys. error				
Mistag electrons	$22.6^{+5.2}_{-1.8}$	$8.19^{+2.06}_{-0.97}$	$2.51^{+0.60}_{-0.19}$	$1.21^{+0.31}_{-0.12}$
Mistag muons	$16.6^{+3.7}_{-1.6}$	$5.60^{+1.54}_{-1.02}$	$1.49^{+0.33}_{-0.09}$	$0.78^{+0.17}_{-0.04}$
Total	$39.2^{+8.6}_{-2.6}$	$13.78^{+3.38}_{-1.65}$	$4.00^{+0.91}_{-0.24}$	$1.99^{+0.47}_{-0.15}$

Questions and Answers

- We add $+20\%$ systematic uncertainty due to the effect of the material on the positive tag rate (Error: this was reported as a symmetric uncertainty on the previous talk)

- We add statistic and systematic errors on the fractions of Non-W events

- Systematic errors are treated as fully correlated

- 9.6 statistical error on mistag prediction quoted in Table 24 changed to 2 (matrix uncertainty only)

Questions and Answers

Q Is there any sensitivity study for applying the QCD veto?

A So far, we are using the standard selection described in CDF Note 6844

- ⋆ No attempt to optimize kinematic requirements like H_T cut or QCD veto
- ⋆ We found this cut reduces the fraction of Non-W events by a factor of 2

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Electrons				
F_{non-W}	0.062 ± 0.003	0.099 ± 0.007	0.124 ± 0.021	0.144 ± 0.049
F_{non-W} (no veto)	0.147 ± 0.004	0.181 ± 0.010	0.201 ± 0.025	0.299 ± 0.076
N^{tag}_{non-W}	9.85 ± 2.26	4.00 ± 1.24	3.08 ± 1.06	1.54 ± 0.72
N^{tag}_{non-W} (no veto)	29.49 ± 3.97	14.04 ± 2.37	6.20 ± 1.49	2.28 ± 0.88
Muons				
F_{non-W}	0.022 ± 0.001	0.028 ± 0.003	0.050 ± 0.014	0.059 ± 0.034
F_{non-W} (no veto)	0.040 ± 0.002	0.051 ± 0.004	0.099 ± 0.018	0.114 ± 0.052
N^{tag}_{non-W}	1.56 ± 0.56	1.95 ± 0.68	0.78 ± 0.37	0.26 ± 0.19
N^{tag}_{non-W} (no veto)	4.75 ± 0.93	3.71 ± 0.72	1.68 ± 0.46	0.48 ± 0.24

- ⋆ Efficiency on signal events is about 94%
- ⋆ Systemtic uncertainty for this method are big (50%)

Questions and Answers

Q Could you show how you compute the numbers of Non-W events in the pretagged sample you quote in Table 12?

A $Pretag = N^{D}_{events} \times F_{non-W}$

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Electrons				
Region D	7819	1202	201	61
F_{non-W}	0.062 ± 0.003	0.099 ± 0.007	0.124 ± 0.021	0.144 ± 0.049
Pretag	486 ± 20	119 ± 8	25 ± 4	9 ± 3
Muons				
Region D	5729	880	117	33
F_{non-W}	0.022 ± 0.001	0.028 ± 0.003	0.050 ± 0.014	0.059 ± 0.034
Pretag	124 ± 8	25 ± 3	6 ± 2	2 ± 1

⋆ N^{D}_{events} and F_{non-W} from Table 8 in the CDF Note 7150

Questions and Answers

Q Can you explain the source of the statistical uncertainties (14% from MC and 0.8% from data) on W+Heavy flavor fraction/tags you quote in Table 23?

A 14% from statistical uncertainty on HF fractions and tagging efficiencies

- ⋆ Error on Wcc uncertainty. This contribution changes to 4%
- ⋆ 0.8% from tag rate matrix statistic (through the F_{non-W} applied to the pretag sample)

Error	Sys (%)	MC stat (%)	Stat from data (%)
Kinematic efficiency	8.7	1	-
Scale Factor (b's/c's)	13/20	-	-
Luminosity	5.9	-	-
QCD fraction	50	-	17
QCD prediction	50	-	34
W+HF fraction/tags	30	4	0.8
Mistag	+20.0	-	2
MC derived (σ's)	1.8	2.7	-

Questions and Answers

Q Uncertainties on the cross sections for diboson and single top production look small. Do they include PDF uncertainty?

A Diboson cross sections computed with MRS98 and CTEQ5 PDF's

- ⋆ Uncertainty is half difference of the results
- ⋆ Single top cross sections computed with CTEQ PDF
- ⋆ Uncertainty estimated by varying choice of scale

Process	Cross Section	MC Sample	Events
WW	13.25 ± 0.25	atop4x	597399
WZ	3.96 ± 0.06	atop0y	191011
ZZ	1.58 ± 0.02	atop0z	242500
Single top $W^\star$	0.88 ± 0.05	ato0sp	239083
Single top W-g	1.98 ± 0.08	atop1s	262084

- ⋆ The effect of these errors on the total uncertainty is negligible even if scaled up by a factor of 20

Questions and Answers

Q The pretagged sample is corrected for the contribution of non-W, and then later for $t\bar{t}$, but is it corrected for MC derived backgrounds?

A Correction for the contribution of MC derived to the pretagged sample is applied in the final iterative procedure to estimate the cross section

- ⋆ The effect of this correction on the pretagged sample is about 4%
- ⋆ For comparison, the effect of the signal correction to the pretagged sample is about 16%

Q Can you show the size of the iterative correction?

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
MC Derived Backgrounds	4.2 ± 0.8	7.7 ± 1.4	2.0 ± 0.4	0.41 ± 0.09
W+HF	100.3 ± 29.3	36.5 ± 9.6	6.6 ± 1.7	1.4 ± 0.4
Mistag	$38.9^{+8.5}_{-2.6}$	$13.2^{+3.2}_{-1.6}$	$3.4^{+0.8}_{-0.2}$	$1.1^{+0.25}_{-0.08}$
Non W	11.4 ± 6.2	6.0 ± 3.3	3.9 ± 2.2	1.8 ± 1.2
Total Background	$154.8^{+31.7}_{-30.6}$	$62.7^{+11.8}_{-11.5}$	$15.9^{+3.3}_{-3.1}$	$4.8^{+1.4}_{-1.4}$
Uncorrected Total Background	$155.8^{+31.7}_{-30.6}$	$65.5^{+11.8}_{-11.5}$	$17.8^{+3.3}_{-3.2}$	$6.9^{+1.5}_{-1.4}$
DATA	131	81	31	28

Questions and Answers

Q Can you quote asymmetric statistical uncertainty?

A Statistical uncertainty derived with several coverage schemes

Intarval	Statistical Error Data	Total Statistical Error
Pearson	+1.26868 -1.11782	+1.2703 -1.11965
Neyman	+1.21073 -1.21073	+1.21242 -1.21242
Likelihood	+1.24159 -1.14103	+1.24323 -1.14282
Improved L	+1.24315 -1.14274	+1.2448 -1.14453
Classical	+1.34843 -1.18746	+1.34995 -1.18919
Unified	+1.28736 -1.191	+1.28895 -1.19271
Pearson’s chi2 Ordering	+1.31443 -1.16341	+1.31599 -1.16517
Probability Ordering	+1.36329 -1.11524	+1.36479 -1.11708

Questions and Answers

- For $N = 59$ the coverage converges to 68.2% for all the schemes

- We take an average of the different results

- We get

  - Upper error = $+1.3$

  - Lower error = -1.2

- Data and MC statistical uncertainties quoted together!

Results for Blessing

- Yield of the events

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Pretag events				
CEM	7819	1202	201	61
CMUP	3758	587	81	27
CMX	1971	293	36	6
Total	13548	2082	318	94
Tagged events				
CEM	78	40	21	17
CMUP	40	30	8	10
CMX	13	11	2	1
Total	131	81	31	28

Results for Blessing

- Summary of acceptances

Quantity	CEM	CMUP	CMX
JP (QCD cut applied, SF = 0.787 $\pm$ 0.105)			
Acc. No Tag	4.09 $\pm$ 0.04 $\pm$ 0.33	2.12 $\pm$ 0.02 $\pm$ 0.21	0.95 $\pm$ 0.01 $\pm$ 0.12
Tag Eff	56.99 $\pm$ 0.28 $\pm$ 6.66	56.88 $\pm$ 0.36 $\pm$ 6.67	57.84 $\pm$ 0.60 $\pm$ 6.67
Average Tag Eff	57.24 $\pm$ 0.21 $\pm$ 3.85		
Acc. with Tag	2.33 $\pm$ 0.03 $\pm$ 0.33	1.21 $\pm$ 0.01 $\pm$ 0.19	0.55 $\pm$ 0.01 $\pm$ 0.09
Lum (pb^{-1})	161.6 $\pm$ 9.5	161.6 $\pm$ 9.5	149.8 $\pm$ 8.8
$\epsilon_{t\bar{t}} \int$ L dt	3.77 $\pm$ 0.05 $\pm$ 0.58	1.95 $\pm$ 0.02 $\pm$ 0.32	0.82 $\pm$ 0.01 $\pm$ 0.15

Results for Blessing

- Mistag background estimate

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Mistag matrix prediction				
Mistag electrons	24.1 $\pm$ 1.8	9.08 $\pm$ 0.95	2.87 $\pm$ 0.03	1.42 $\pm$ 0.03
Mistag muons	17.0 $\pm$ 1.6	5.76 $\pm$ 1.05	1.57 $\pm$ 0.08	0.83 $\pm$ 0.01
Total	41.1 $\pm$ 2.5	14.84 $\pm$ 1.66	4.44 $\pm$ 0.09	2.26 $\pm$ 0.03
Prediction $\times$ (1-F$_{QCD}$) & $+20\%$ sys. error				
Mistag electrons	$22.6^{+5.2}_{-1.8}$	$8.19^{+2.06}_{-0.97}$	$2.51^{+0.60}_{-0.19}$	$1.21^{+0.31}_{-0.12}$
Mistag muons	$16.6^{+3.7}_{-1.6}$	$5.60^{+1.54}_{-1.02}$	$1.49^{+0.33}_{-0.09}$	$0.78^{+0.17}_{-0.04}$
Total	$39.2^{+8.6}_{-2.6}$	$13.78^{+3.38}_{-1.65}$	$4.00^{+0.91}_{-0.24}$	$1.99^{+0.47}_{-0.15}$

Results for Blessing

- Pretag events count

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Pretag Electrons				
Region A	23522	3692	541	69
Region B	18584	1800	222	32
Region C	615	243	61	19
Region D	7819	1202	201	61
F_{non-W}	0.062 ± 0.003	0.099 ± 0.007	0.124 ± 0.021	0.144 ± 0.049
Pretag Muons				
Region A	7982	1404	180	31
Region B	3247	304	42	6
Region C	304	115	25	10
Region D	5729	880	117	33
F_{non-W}	0.022 ± 0.001	0.028 ± 0.003	0.050 ± 0.014	0.059 ± 0.034

Results for Blessing

- Non-W background estimate

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
Electrons				
$(B/A)_{tagged}$	0.47 ± 0.03	0.31 ± 0.04		
C_{tagged}	21	13	10	5
N^{tag}_{non-W}	9.85 ± 2.26	4.00 ± 1.24	3.08 ± 1.06	1.54 ± 0.72
Muons				
$(B/A)_{tagged}$	0.17 ± 0.02	0.13 ± 0.03		
C_{tagged}	9	15	6	2
N^{tag}_{non-W}	1.56 ± 0.56	1.95 ± 0.68	0.78 ± 0.37	0.26 ± 0.19
Final result	11.41 ± 2.34	5.95 ± 1.41	3.86 ± 1.13	1.80 ± 0.75

Results for Blessing

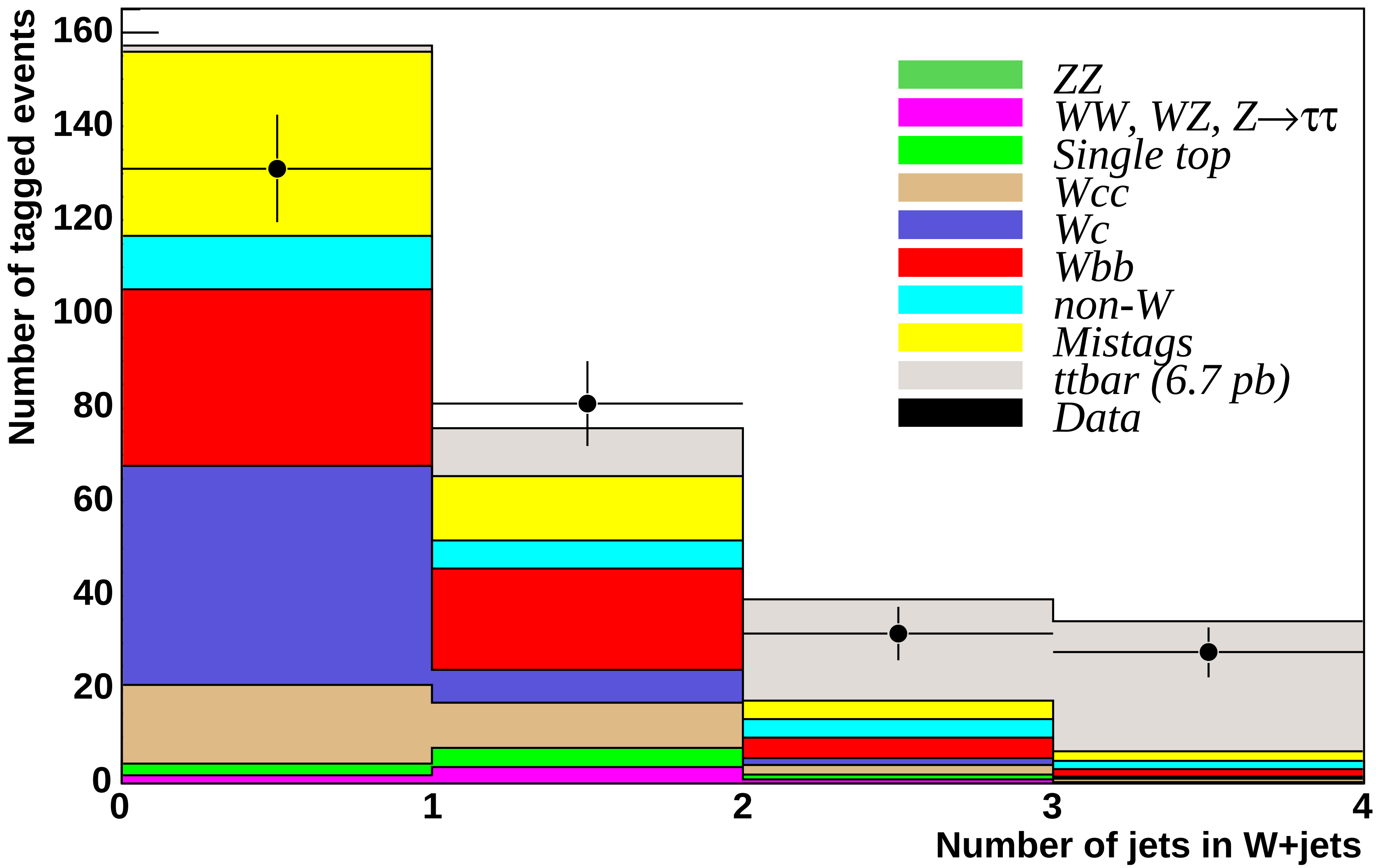
- Tagging efficiency for W+HF events

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
1B($\geq$ 1tag)	29.0 ± 3.8	27.5 ± 3.6	28.6 ± 3.7	28.4 ± 3.8
2B($\geq$ 1tag)	0 ± 0	51.8 ± 6.8	48.5 ± 6.4	48.1 ± 6.3
1C($\geq$ 1tag)	8.1 ± 1.6	7.9 ± 1.6	7.8 ± 1.6	7.7 ± 1.6
2C($\geq$ 1tag)	0 ± 0	16.9 ± 3.4	15.5 ± 3.1	15.7 ± 3.2
Wc($\geq$ 1tag)	8.4 ± 1.7	8.4 ± 1.7	8.2 ± 1.6	8.2 ± 1.7

Results for Blessing

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
MC Derived Backgrounds				
WW	0.753 $\pm$ 0.127	1.553 $\pm$ 0.259	0.437 $\pm$ 0.075	0.088 $\pm$ 0.017
WZ	0.539 $\pm$ 0.095	1.051 $\pm$ 0.180	0.319 $\pm$ 0.059	0.057 $\pm$ 0.015
ZZ	0.036 $\pm$ 0.008	0.078 $\pm$ 0.015	0.043 $\pm$ 0.009	0.009 $\pm$ 0.003
$Z\tau^+\tau^-$	0.473 $\pm$ 0.185	0.814 $\pm$ 0.256	0.172 $\pm$ 0.104	0.052 $\pm$ 0.053
Single Top (W^*)	0.538 $\pm$ 0.094	1.783 $\pm$ 0.312	0.558 $\pm$ 0.098	0.131 $\pm$ 0.024
Single Top (W-g)	1.907 $\pm$ 0.326	2.429 $\pm$ 0.414	0.498 $\pm$ 0.087	0.075 $\pm$ 0.015
Total	4.245 $\pm$ 0.774	7.708 $\pm$ 1.388	2.027 $\pm$ 0.382	0.412 $\pm$ 0.090
W + HF				
Wbb	37.52 $\pm$ 12.32	21.53 $\pm$ 6.80	4.43 $\pm$ 1.27	1.56 $\pm$ 0.50
W$c\bar{c}$	16.77 $\pm$ 5.91	9.57 $\pm$ 1.96	1.96 $\pm$ 0.64	0.71 $\pm$ 0.25
Wc	46.74 $\pm$ 13.50	7.00 $\pm$ 2.06	1.48 $\pm$ 0.43	0.42 $\pm$ 0.13
Total	101.0 $\pm$ 29.5	38.10 $\pm$ 10.03	7.87 $\pm$ 1.99	2.69 $\pm$ 0.76
Others				
Mistag	$39.2^{+8.6}_{-2.6}$	$13.78^{+3.38}_{-1.65}$	$4.00^{+0.91}_{-0.24}$	$1.99^{+0.47}_{-0.15}$
Non W	11.41 $\pm$ 6.17	5.95 $\pm$ 3.29	3.86 $\pm$ 2.24	1.80 $\pm$ 1.17
Total Background	$155.85^{+31.70}_{-30.62}$	$65.53^{+11.83}_{-11.46}$	$17.76^{+3.28}_{-3.16}$	$6.89^{+1.50}_{-1.43}$
$t\bar{t}$ (6.7 pb)	1.18 $\pm$ 0.20	8.99 $\pm$ 1.53	19.10 $\pm$ 3.25	24.51 $\pm$ 4.17
DATA	131	81	31	28

Results for Blessing



Results for Blessing

- We calculate the $t\bar{t}$ cross section as

$$\sigma_{t\bar{t}} = \frac{N_{obs} - B_{bkg}}{\epsilon_{t\bar{t}} \times \int L dt}$$

- Iterative procedure to correct mistag and $W+$ Heavy flavor background predictions for $t\bar{t}$ contribution to pretagged sample applied

- Diboson, $Z \rightarrow \tau\tau$ and single top expectations are also subtracted

- Finally we get

$$\sigma = 5.8^{+1.3}_{-1.2}(stat)^{+1.3}_{-1.3}(syst)\ pb$$

Results for Blessing

- Effect of the iterative correction

Jet Multiplicity	1 jet	2 jets	3 jets	$\geq$ 4 jets
MC Derived Backgrounds	4.2 ± 0.8	7.7 ± 1.4	2.0 ± 0.4	0.41 ± 0.09
W+HF	100.3 ± 29.3	36.5 ± 9.6	6.6 ± 1.7	1.4 ± 0.4
Mistag	$38.9^{+8.5}_{-2.6}$	$13.2^{+3.2}_{-1.6}$	$3.4^{+0.8}_{-0.2}$	$1.1^{+0.25}_{-0.08}$
Non W	11.4 ± 6.2	6.0 ± 3.3	3.9 ± 2.2	1.8 ± 1.2
Total Background	$154.8^{+31.7}_{-30.6}$	$62.7^{+11.8}_{-11.5}$	$15.9^{+3.3}_{-3.1}$	$4.8^{+1.4}_{-1.4}$
Uncorrected Total Background	$155.8^{+31.7}_{-30.6}$	$65.5^{+11.8}_{-11.5}$	$17.8^{+3.3}_{-3.2}$	$6.9^{+1.5}_{-1.4}$
DATA	131	81	31	28

Results for Blessing

- Summary of the statistical and systematic uncertanties

Error	Sys (%)	MC stat (%)	Stat from data (%)
Kinematic efficiency	8.7	1	-
Scale Factor (b's/c's)	13/20	-	-
Luminosity	5.9	-	-
QCD fraction	50	-	17
QCD prediction	50	-	34
W+HF fraction/tags	30	4	0.8
Mistag	+20.0	-	2
MC derived (σ's)	1.8	2.7	-